TYPE SA-1 SEARCHLIGHT SIGNAL

GENERAL RAILWAY SIGNAL COMPANY

GRS DEVELOPMENT D50.0102

REVISED FEBRUARY 1963

REPLACES DEVELOPMENT D50.0102 DATED JANUARY 1963

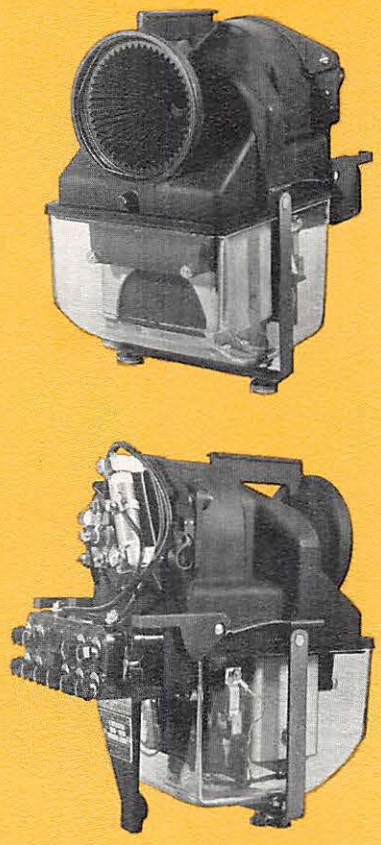

FIGURE 1. TYPE SA-1 SIGNAL MECHANISM

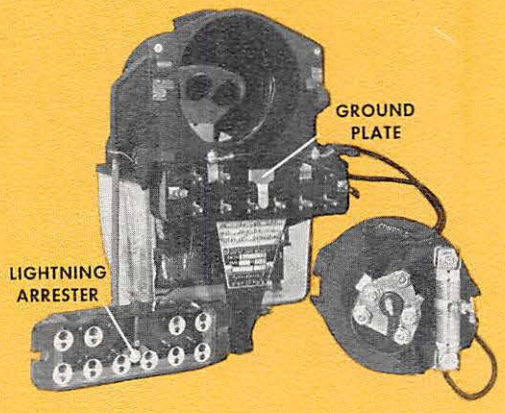

FIGURE 2. LAMP REFLECTOR AND PLUG COUPLER REMOVED

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INTRODUCTION

The Type SA-1 searchlight signal, basically similar to the Type SA searchlight signal, incorporates a number of improvements which provide increased operating efficiency. The major improvements include: a redesigned electromagnetic structure, increased back contact pressure, positive contact closure, and precise color-disc positioning.

Like the SA, the Type SA-1 signal is designed to operate from battery or rectified a-c. It projects three aspects – red, yellow, and green – through a single optical system. The optical system produces a powerful signal aspect with minimum energy consumption. Daylight range with a compound lens system for tangent track is one mile, with a 5-watt lamp.

The mechanism uses a rotary movement principle to position the spectacle arm. The polarity of the control circuit determines whether a yellow or a green color disc is positioned in the light beam. When the circuit is deenergized, the red color disc is positioned, by gravity, to color the beam.

DESCRIPTION

The Type SA-1 signal mechanism, Figure 1, fits Type SA signal housings now being supplied.

The redesigned "yellow" and "green" contacts feature twice the back contact pressure to provide more uniform pressure throughout their useful life. A large diameter flywheel, friction mounted on the spectacle shaft, provides "follow-through" inertia so that the contacts close positively, without rebound, in the green and yellow positions. Color flashes are thus eliminated. Suspension counterweights snub the contacts to a clean, solid closure in the red position.

Figure 2 shows the SA-1 mechanism with the lamp and reflector holder removed. The reflector holder features a plug-in, adjustable lamp resistor, which makes it easy to match the lamp you plan to use. Resistors are available in three different resistances - one, two, and five ohms. Also in Figure 2, the removable half of the plug coupler shows the air-gap lightning arrester which provides a path from case to control wires for surges in excess of 2000 volts.

The spectacle arm, which carries the color discs, is inclined toward the reflector so that each color disc is positioned just out of the maximum heat area of the reflector's focal point. This arrangement protects the color discs against thermal shock, yet provides for full, effective coloring of the light beam. Also, by slanting the color disc, dilution of the color aspect due to mirror effect is prevented, since outside light returning from the front of the signal is reflected upward, rather than back into the color beam.

The spectacle shaft assembly has stops of laminated phenolic, a proven material used with excellent results in highway flashing and code-responsive relays. The shaft is supported by knife edge bearings of a type which, while practically friction free, have demonstrated outstanding ability to withstand wear and vibration in the Type SA mechanism.

The design of the electromagnet structure allows substantial clearance between moving and stationary parts. Quarter-inch air gap – four times greater than in the Type SA mechanism – ensures against interference from foreign material.

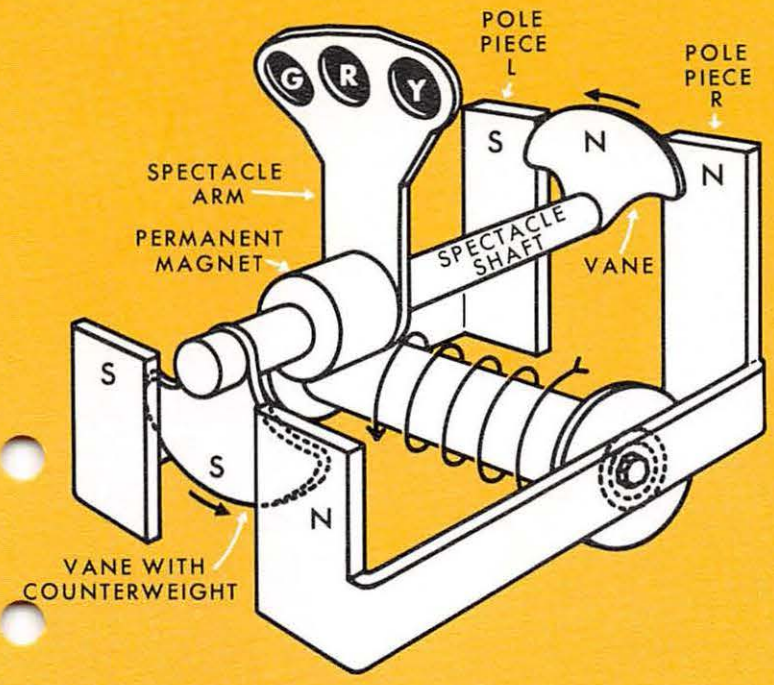

FIGURE 3. PRINCIPLES OF OPERATION

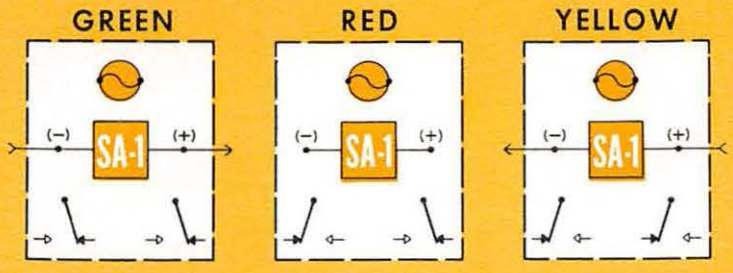

FIGURE 4. TYPE SA-1 MECHANISM CONTACT POSITIONS—VIEW FACING TERMINAL BLOCK

OPERATION

The principles of operation for the Type SA-1 mechanism are illustrated in Figure 3. Polar operation is effected by a permanent magnet, mounted on the spectacle shaft, which polarizes the upper vane north (N) and the lower vane (with counterweight) south (S). The stationary coil, suspended below the spectacle shaft, controls the polarity of pole pieces R and L. With the spectacle shaft assembly isolated from the coil, the possibility of surge currents entering and causing damage to the knife edge bearings is eliminated.

With no energy applied to the coil, the spectacle arm is held in the center (red) position by gravity, due to the counterweight. When energy is applied to the coil, with polarity as shown, pole piece R on the electromagnet is polarized north, and pole piece L is polarized south. As unlike poles attract, the south pole of the permanent magnet (lower vane) is attracted to pole piece R, and the north pole (upper vane) is attracted to pole piece L. As a result, the yellow color disc is positioned in the light beam.

When the polarity of the coil is reversed, the magnetic flux in the core is also reversed. Rotation of the armature in the opposite direction then positions the green color disc in the light beam.

A copper slug on the core of the electromagnet dampens the movement of the spectacle arm when energy is removed from the coil. This electromagnetic damping action, together with the nonbounce characteristics of the mechanical movement, positions each color disc precisely and accurately. This positioning is accomplished without overtravel, which could result in a momentary display of an improper aspect.

CONTACT POSITION

Contact position in relation to the polarity of the applied voltage is shown in Figure 4. The contacts are operated by two counterweights which, in turn, are operated through link connections to the rotating spectacle arm.

DIMENSIONS AND WEIGHTS

SIGNAL HOUSING DIMENSIONS

Overall length of signal, including hood – compound lens system . . 34 in.

Overall length of signal, including hood – stepped lens system 29-3/4 in.

Overall height of signal – either optical system . . . . . 27-7/8 in.

Lens bezel ring, overall diameter. . . . . 10 in.

WEIGHT

Signal housing and signal mechanism – stepped lens arrangement . . . . . 140 lbs. total

Signal housing and signal mechanism – compound lens arrangement. . . . 160 lbs. total

Signal mechanism only. . . . . 25 lbs.

ELECTRICAL CHARACTERISTICS

The connection diagram for the Type SA-1 signal is shown in Figure 5. The signal, with a coil resistance of 250 ohms, is designed to operate on 10 volts (5 lead cells or equivalent). The minimum current required for proper operation is 24 ma.

Wires from the plug coupler to the contacts, including the coil wires, are equipped with quick-detachable terminals which require no soldering.

Operating times for the Type SA-1 signal, at 10 volts d-c, are as follows:

Time to close contact from red (deenergized) to yellow (or red to green). . . . . 0.65 sec.

Time to close red (deenergized) contact from either green or yellow position (time starts when energy is removed) . . . . . 0.58 sec.

Time to close green contact from yellow position (or yellow contact from green position) after energy is pole-changed . . . . . 0.58 sec.

Time yellow to green contact is open (or green to yellow contact is open) during pole change (time that circuit to yellow-green repeater relay is open) . . . . . 0.165 sec.

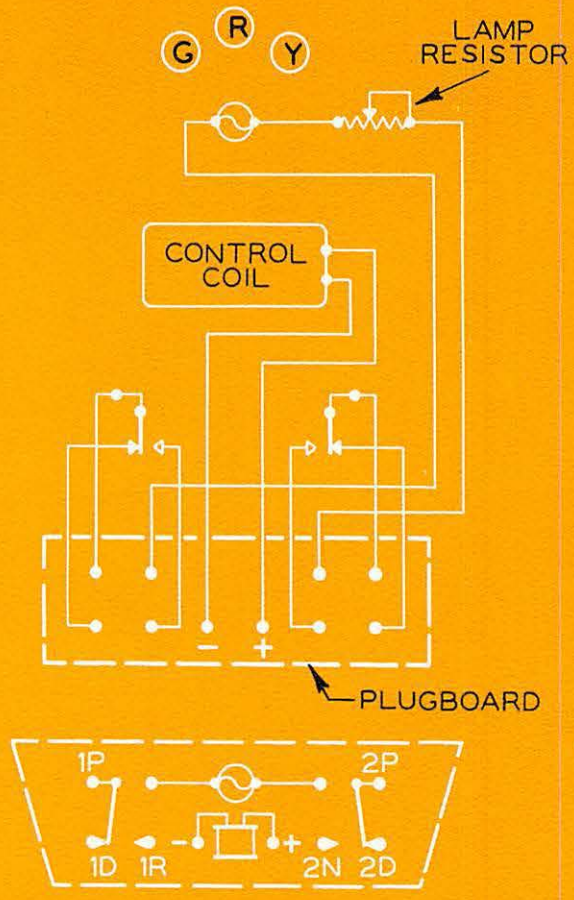

FIGURE 5. TYPE SA-1 SIGNAL CONNECTION DIAGRAM—VIEW FACING PLUGBOARD

A Check List OF SA-1 SIGNAL FEATURES

- Aspect-checking contacts directly operated by counterweights.
- All color discs slanted to minimize beam dilution.
- Choice of compound lens or stepped lens optical system.
- Available with 20-degree deflecting roundel or with 30-degree Spredlite roundel.
- Available with Phankill unit.
- Includes a wide choice of wire entrance couplings.
- Precision filament lamp, no refocusing needed when changing out.
- Plug-coupled connections. Plug coupler has built-in surge arrester—provides a discharge gap between each control wire and the signal case.
- Plug-in, cartridge-type, adjustable lamp resistor.
- Available in wide choice of assemblies: one-, two-, or three-unit high signals; one-or two-unit dwarf signals; and one-, two-, or three-unit bracket post or bridge signals. Matching, single-aspect marker lights also available.
- Built-in sighting fixture, screened vents, easy-latching door, ample wiring space.
- Mechanically, electrically, and optically interchangeable with Type SA Signal. Same size, weight, and outer housing.

TOOLS FOR TRANSPORTATION

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